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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 116-02 WO	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US03/30276	International filing date (day/month/year) 26 September 2003 (26.09.2003)	Priority date (day/month/year) 27 September 2002 (27.09.2002)
International Patent Classification (IPC) or national classification and IPC IPC(7): C22B 3/00, 15/00 and US Cl.: 423/27, 28, 38, 39, 40, 41; 75/743; 204/157.15		
Applicant THE BOARD OF REGENTS OF UNIVERSITY & COMMUNITY COL		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

**CORRECTED  
VERSION**

Date of submission of the demand 22 April 2004 (22.04.2004)	Date of completion of this report 01 November 2004 (01.11.2004)
Name and mailing address of the IPEA/US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Authorized officer Steven Bos Jean Proctor Paralegal Sp Telephone No. 571-272-1700

Form PCT/IPEA/409 (cover sheet)(July 1998)

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US03/30276

## I. Basis of the report

## 1. With regard to the elements of the international application:\*

- ☐ the international application as originally filed.
- ☒ the description:  
pages 1-14 as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.
- ☒ the claims:  
pages NONE, as originally filed  
pages NONE, as amended (together with any statement) under Article 19  
pages NONE, filed with the demand  
pages 18-20, filed with the letter of 15 January 2004 (15.01.2004)
- ☒ the drawings:  
pages 1, as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.
- ☐ the sequence listing part of the description:  
pages NONE, as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.  
These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages NONE
- ☐ the claims, Nos. NONE
- ☐ the drawings, sheets/fig NONE

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/US03/30276

## V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. STATEMENT

Novelty (N)	Claims <u>2-5,10-12,14-16 and 18-27</u>	YES
	Claims <u>1,6-9,13 and 17</u>	NO
Inventive Step (IS)	Claims <u>2-5,10-12,14-16 and 18-27</u>	YES
	Claims <u>1,6-9,13 and 17</u>	NO
Industrial Applicability (IA)	Claims <u>1-27</u>	YES
	Claims <u>NONE</u>	NO

### 2. CITATIONS AND EXPLANATIONS

Claims 1,6-9,13,17 lack novelty under PCT Article 33(2) as being anticipated by Staker. Staker teaches the instantly claimed process of adding a titanium compound in an acidic lixiviant to chalcopyrite at a temperature of 25-50°C to extract copper therefrom.

Claims 1,6-9,13,17 lack an inventive step under PCT Article 33(3) as being obvious over Staker. Staker teaches the instantly claimed process of adding a titanium compound in an acidic lixiviant to chalcopyrite at a temperature of 25-50°C to extract copper therefrom.

Claims 1-27 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Claims 2-5,10-12,14-16,18-27 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest the concentration of claim 2, the lixiviant of claims 3,4,15,16,22-27 the application of uv light of claims 5,14, the particle size of claim 10, the titanium dioxide of claims 11,18, the silica compound of claims 12,19,20, and the combination of process steps of claim 21.

----- NEW CITATIONS -----

**AMENDED CLAIMS**

[received by the International Bureau on 15 Januar 2004 (15.01.04);  
new claims 22-27 added; claims 1-21 unchanged (3 pages)]

We claim:

1. A method of extracting copper from a copper-containing mineral comprising:  
adding a lixiviant and a silica-containing compound or titanium-containing compound to  
a copper-containing mineral, forming a composition;  
separating the copper extracted from the composition.
2. The method of claim 1, wherein the concentration of the silica-containing compound or  
titanium-containing compound is at least 5 gm/liter in the composition.
3. The method of claim 1, wherein the lixiviant is one or more selected from the group  
consisting of: ferric ion, oxidants, hydrogen peroxide, ethylene glycol, chlorate,  
permanganate, bleach, iodide and bacteria.
4. The method of claim 3, wherein the lixiviant is one or more selected from the group  
consisting of: ferric ion, hydrogen peroxide and ethylene glycol.
5. The method of claim 1, further comprising applying ultraviolet light to the composition.
6. The method of claim 1, further comprising adjusting the pH of the composition to acidic.
7. The method of claim 1, further comprising adjusting the temperature of the composition  
to between about 25 and 85°C.
8. The method of claim 1, wherein the mineral further comprises sulfur.
9. The method of claim 8, wherein the mineral is chalcopyrite.
10. The method of claim 1, wherein the silica-containing compound or titanium-containing  
compound has a particle size of less than about 200 microns.
11. The method of claim 1, wherein the titanium-containing compound is titanium dioxide.

**AMENDED SHEET (ARTICLE 19)**

12. The method of claim 1, wherein the silica-containing compound is selected from the group consisting of:  $\text{SiO}_2$ , silicic acid, fluorosilicic acid, glass sand, borosilicate, dissolved silica, silica gel and colloidal silica.
13. A method of extracting copper from a sulfur-containing copper mineral comprising:  
adding a lixiviant and a silica-containing compound or titanium-containing compound to a sulfur-containing copper mineral, forming a composition;  
adjusting the pH of the composition to be acidic;  
adjusting the temperature of the composition to between about 25 and 85°C; and  
separating the extracted copper from the composition.
14. The method of claim 13, further comprising adding ultraviolet light to the composition.
15. The method of claim 13, wherein the lixiviant is one or more selected from the group consisting of: ferric ion, hydrogen peroxide, chlorate, ethylene glycol, permanganate, bleach, iodide and bacteria.
16. The method of claim 15, wherein the lixiviant is one or more selected from the group consisting of: ferric ion, hydrogen peroxide and ethylene glycol.
17. The method of claim 13, wherein the sulfur-containing copper mineral is chalcopyrite.
18. The method of claim 13, wherein the titanium-containing compound is titanium dioxide.
19. The method of claim 13, wherein the silica-containing compound is selected from the group consisting of:  $\text{SiO}_2$ , silicic acid, fluorosilicic acid, glass sand, borosilicate, dissolved silica, silica gel and colloidal silica.
20. The method of claim 1, wherein the silica-containing compound or titanium-containing compound has a particle size of less than 200 microns.
21. A method of extracting copper from a sulfur-containing copper mineral comprising:

AMENDED SHEET (ARTICLE 19)

adding one or more lixiviants selected from the group consisting of: ferric ion, hydrogen peroxide and ethylene glycol, and a silica-containing compound or titanium-containing compound to a sulfur-containing copper mineral, forming a composition, wherein the concentration of sulfur-containing copper mineral:silica-containing compound or titanium-containing compound is about 1:1;

adjusting the pH of the composition to be acidic;

adjusting the temperature of the composition to above about 45 °C;

applying ultraviolet light to the composition; and

separating the extracted copper from the composition.

22. A method of extracting copper from a copper mineral comprising:  
adding a silica-containing or titanium-containing compound and one or more substances selected from the group consisting of: ethylene glycol, ferric ion and hydrogen peroxide to a copper-containing mineral, forming a composition;  
separating the copper extracted from the composition.
23. The method of claim 22, wherein the copper-containing mineral includes sulfur.
24. The method of claim 22, wherein the copper-containing mineral is chalcopyrite.
25. A method of extracting copper from a copper mineral comprising:  
adding ethylene glycol, ferric ion, hydrogen peroxide and a silica-containing compound to a copper-containing mineral, forming a composition;  
separating the copper extracted from the composition.
26. The method of claim 25, wherein the copper-containing mineral includes sulfur.
27. The method of claim 25, wherein the copper-containing mineral is chalcopyrite.